

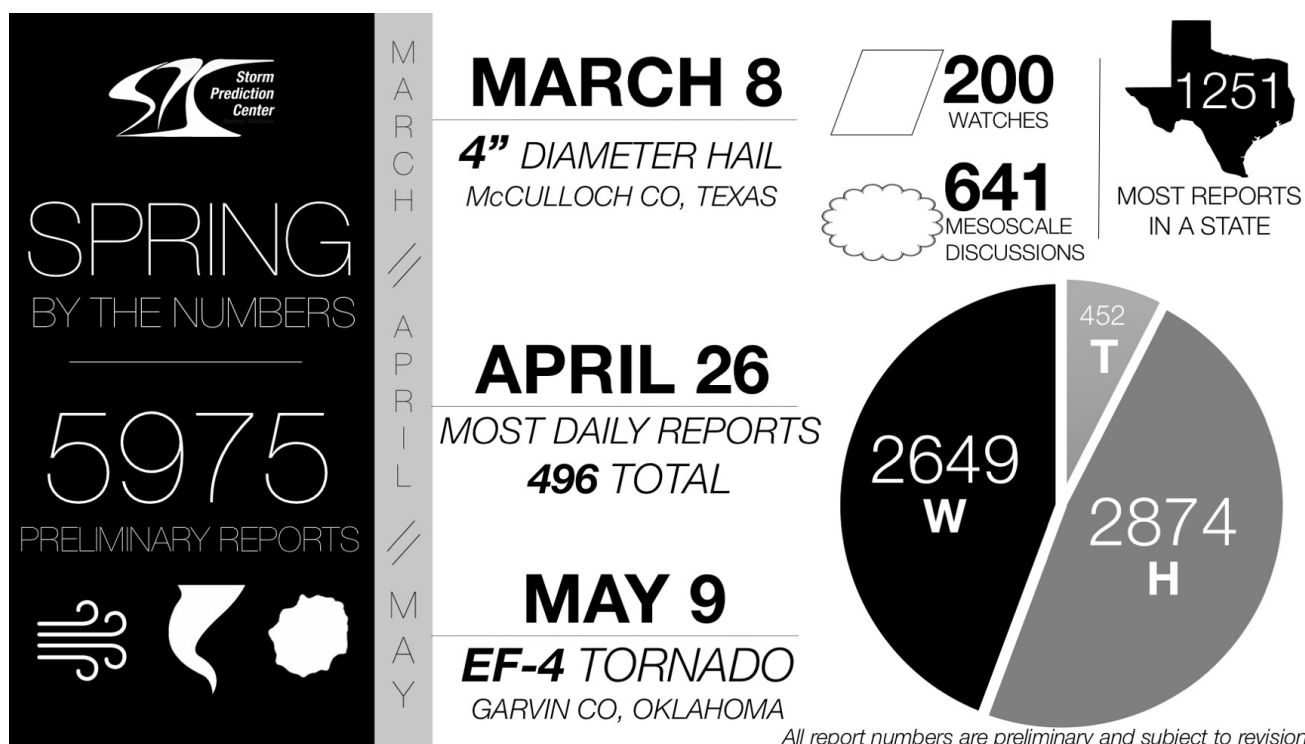
THE CONVECTIVE WATCHER

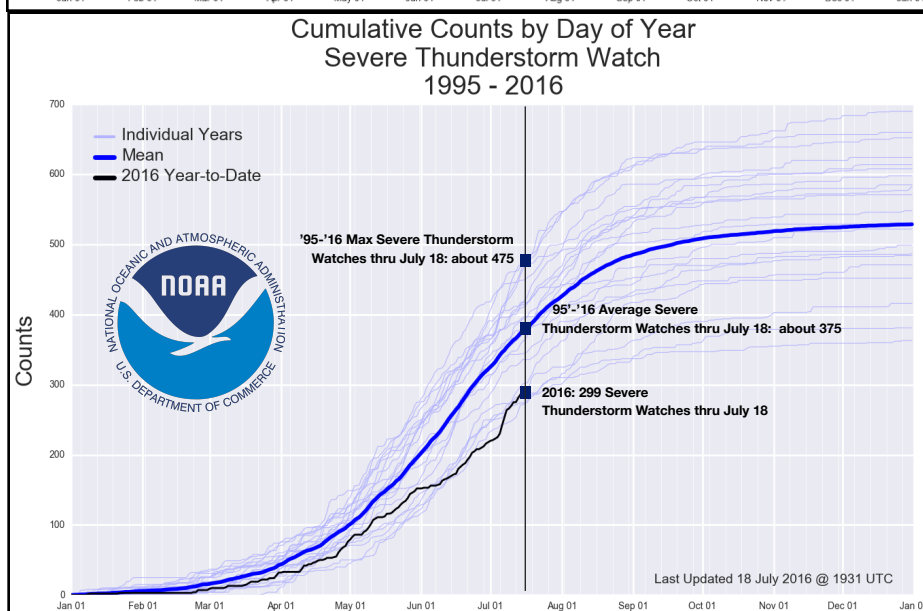
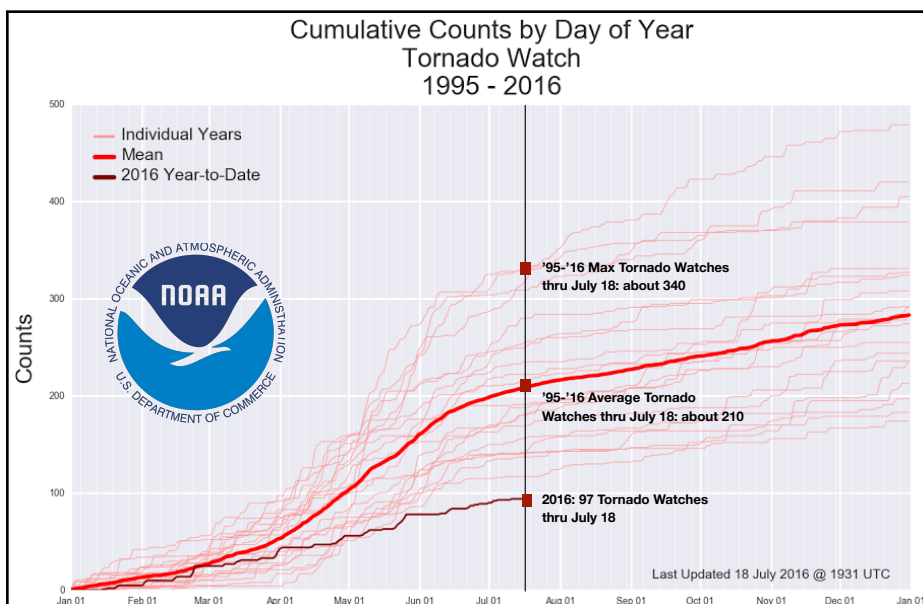


By The Numbers...

By Joey Picca and Liz Leitman, Mesoscale Assistant/Fire Weather Forecasters, and Dr. Patrick Marsh, Science Support Branch/Techniques Development Meteorologist

A quick glance at preliminary storm reports from this spring gives the appearance of a very busy severe weather season with nearly 6,000 severe weather reports, including violent tornadoes and destructive hail, and numerous watches issued.





But how does 2016 severe weather stack up to previous years? When using watch count as a metric for determining how active severe weather has been, 2016 has been slow — very slow. In fact, this year's January through mid-July watch count is smaller than for any other year since 1995. As of July 18th, SPC has issued fewer than 400 watches of any type, with fewer than 100 of those being tornado watches.

So what does this mean for the rest of 2016? It is hard to say how active severe weather will be through the rest of the summer and into the fall and winter months, though climatologically, severe weather typically is on a decline during this time. However, 2016 is on track to be one of the least active years on record, especially if there were not to be any widespread severe weather events the remainder of this year.

UPDATE: Through August 9th, 434 total watches have been issued (98 tornado, 336 severe thunderstorm).

Did you know...

The SPC is staffed 24 hours a day, every day of the year, including holidays. During a typical year, that means 3,285 routine convective outlooks and 1,825 routine fire weather outlooks (encompassing days 1-8) are issued from our office! That is about 9 convective outlooks and 5 fire weather outlooks per day.

Storm Prediction Center Lead Forecaster Steve Corfidi Retires

By Dr. Ariel Cohen, Mesoscale Assistant/Fire Weather Forecaster



Storm Prediction Center Lead Forecaster Stephen (Steve) Corfidi has retired after providing 36 years of federal service in the National Weather Service, 22 of which have been as a Lead Forecaster at the SPC. Steve's career in the National Weather Service began in 1980, when he served as a student meteorologist at the Meteorological Development Laboratory. Steve was then selected for the "graduate scientist" program. He worked three months each at the Baltimore Weather Forecast Office, the Meteorological Development Laboratory, the National Meteorological Center, and the Severe Local Storm Warning Center (SELS), while finishing his last year as a student at The Pennsylvania State University. In 1982, he started his career at the National Severe Storms Forecast Center. After forecasting for the National Meteorological Center from 1987 to 1994, he returned to the National Severe Storms Forecast Center, which eventually became the Storm Prediction Center, where he became a Lead Forecaster. Steve is known for issuing the Tornado Watch leading up to the Jarrell, Texas F5 tornado of May 27, 1997 and the Particularly Dangerous Situation Severe

Thunderstorm Watch leading up to the "Super Derecho" of May 8, 2009, amongst many other forecast decisions that required detailed analysis and investigation to determine the subtleties favoring severe thunderstorms and tornadoes.

Mr. Corfidi has earned numerous awards throughout his career, and the following are some examples. Steve was a member of a team that earned the U.S. Department of Commerce Silver Medal for their work with the April 2, 1982 tornado outbreak. He also issued the Particularly Dangerous Situation Tornado Watch for Tuscaloosa, AL on December 16, 2000, for which SPC earned the U.S. Department of Commerce Silver Medal award. Additionally, Steve earned the United States Department of Commerce Gold Medal as a member of an SPC team that forecasted for the 4-10 May 2003 sequence of severe weather outbreaks across portions of the central and southern United States. In 2004, Steve received an award from the National Weather Association – the T. Theodore Fujita Research Achievement Award for his contributions to weather forecasting. Also in 2004, Steve became a Fellow

of the American Meteorological Society. In 2009, Corfidi received the Alumni Achievement Award from The Pennsylvania State University – his alma mater.

While these accomplishments, alone, demonstrate his commitment to providing public service, he has also established an outstanding record of operational meteorology research, advancing convective forecasting forward through research that he has performed throughout his diverse career. His research on mesoscale convective system motion has become manifested in the vernacular of forecasters across the country as the often-used term “Corfidi Vectors.” While Steve’s work with mesoscale convective system motion is a major contribution, he has worked tirelessly to consistently provide well-respected and frequently referenced research spanning a broad range of topics, from historical pieces to heavy rainfall events to damaging wind events and derechos to haze and much more. He has maintained the “About Derechos” webpage on the SPC website. Steve’s most recent contribution to the meteorological community is a paper in the *Bulletin of the American Meteorological Society* that proposes a revision to the definition of the term “derecho.”

Steve has also been very active in professional meteorology organizations and mentoring the next generations of meteorologists. He has served as a councilor of the American Meteorology Society; he has formally reviewed numerous publications; and he has been a trusted individual to discuss the physics of meteorology. Mr. Corfidi is well known for his vivid descriptions of clouds, and his understanding of the relationships between cloud processes and larger-scale meteorological dynamics. Steve’s mentorship of students at The Pennsylvania State University in online courses that he has taught, and his mentorship of many other students, including the author of this article, demonstrate his passion for spreading knowledge and leveraging the next generation of forecasters.

Steve’s contributions to meteorology and society have been numerous, and his dedication to maintaining a watchful eye on severe weather across the country serves as a role model to many. Steve met his wife, Sarah, when she came to work as a Mesoscale Assistant / Fire Weather Forecaster at the SPC. The Corfidi family has moved to Tulsa following Steve’s retirement. Though Steve has retired from the SPC, we expect he will continue contributing to the field of meteorology.

SPC in the Classroom

By Dr. Ariel Cohen, Dr. Ashton Cook and Liz Leitman, Mesoscale Assistant/Fire Weather Forecasters

Storm Prediction Center and University of Oklahoma co-teach meteorology graduate course

Mesoscale Assistant/Fire Weather Forecaster Dr. Ariel Cohen and Lead Forecaster Rich Thompson from the Storm Prediction Center (SPC), recently finished co-teaching the University of Oklahoma (OU) graduate level-course, “Applications of Meteorological Theory to Severe-Thunderstorm Forecasting,” during spring semester 2016. The course was created and offered for the first time during spring semester 2015. Ariel’s former Doctoral Advisor, Dr. Steven Cavallo, was instrumental in serving as a mentor in the development of the course. He provided official oversight of the class during the past couple of years. More than 20 students took the course during spring semester 2016. The class represented a diverse group from junior year to doctoral students.

The course was taught exclusively by staff from the SPC, other offices in the National Weather Service (NWS) and National Severe Storms Laboratory (NSSL) staff, primarily led by Ariel and Rich. The curriculum included topics such as storm-induced perturbation pressure gradients, quasi-geostrophic theory, decision-support services, supercells and tornadogenesis, mesoscale convective systems, tropical cyclone tornadoes, surface and upper-air analyses, and forecast and warning decision-making.

In addition to exposing students to theoretical equation development relevant for severe-thunderstorm forecasting, students experienced numerous hands-on activities involving real-time and retrospective severe-

thunderstorm forecasting. They worked one-on-one with forecasters who shared their expertise with the students. This proved to be a tremendous learning opportunity for the students. Their comprehensive final examination involved the preparation of an SPC-style severe thunderstorm outlook that integrated much of the course content throughout the semester.

The course gained notoriety within the larger meteorological community, owing to its design that cultivates strong relationships among multiple sub-disciplines of meteorology: operations, academia, and research. The rich diversity of the curriculum appealed to a multitude of students' interests that fostered even stronger bonds between the SPC, NWS, NSSL, and the OU School of Meteorology.

The opportunity was uniquely made possible by SPC's collocation with other meteorological agencies within the National Weather Center located on the OU campus. The instructors of the class and supporting local NOAA management invested greatly in the endeavor, offering well-received dedication and flexibility through planning and hosting the class.

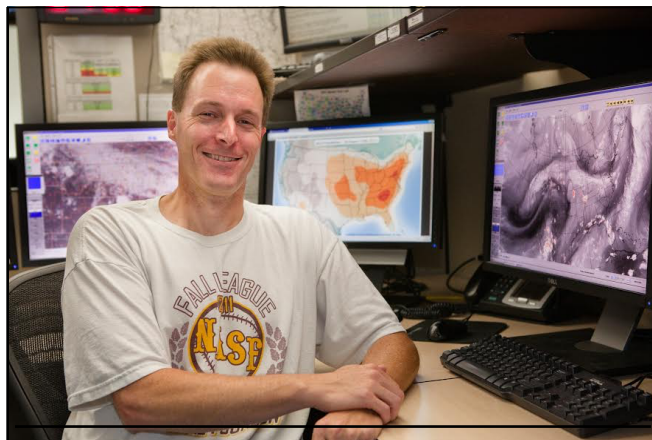
Ariel, Rich, and Steven are proud of how strongly their students grew throughout the semester and are excited for the opportunities that will arise for their students directly owing to the course.



The Applications of Meteorological Theory to Severe-Thunderstorm Forecasting class, instructors Dr. Ariel Cohen and Rich Thompson, along with many guest lecturers.

Tornado Forecasting Workshop

SPC Lead Forecaster Rich Thompson led a nine-part workshop on tornado forecasting from February to April at the National Weather Center (NWC). This class was open to anyone. Once a week, Thompson presented a different aspect of tornado forecasting at a level understandable to undergraduate students, severe storm enthusiasts, and beginning NWS forecasters. This workshop was the first formal collaboration between the SPC and the OU Student Chapter of the American Meteorological Society (AMS) and the National Weather Association (NWA). Topics included: sounding analysis and synoptic meteorology, severe storm ingredients, supercell and tornado conceptual models, convective mode forecasting, and other topics. The final session included a real-time forecasting exercise. The OU School of Meteorology information technology staff streamed live and recorded each workshop. All presentations are available at <http://live.som.ou.edu> and provide great severe storms forecasting reference material for new NWS interns and forecasters. Based on online viewership and NWC attendance checks, the reach of these workshops is estimated to be more than 10,000 people.



Lead forecaster Rich Thompson led the nine-part workshop on tornado forecasting at the National Weather Center last spring.

Online Mesoscale Forecasting Course

SPC Lead Forecaster Stephen Corfidi has instructed multiple sessions of “Fundamentals of Mesoscale Weather Forecasting,” an online course administered by The Pennsylvania State University (PSU) Department of Meteorology under PSU’s World Campus program. Corfidi, who earned a master’s degree in meteorology from PSU, shared his many years of experience as a severe storms forecaster. The course, part of a multi-course certificate program in weather forecasting, applies atmospheric principles to smaller-scale weather systems, emphasizing the conceptual modeling and forecasting of severe thunderstorms. Corfidi’s 30 students ranged from undergraduates to professional adults, doctors and law enforcers. In addition to spending numerous hours answering students’ questions and reviewing their work, he was able to work one-on-one with students to encourage their growth in meteorology and using online resources. In this regard, he incorporated many aspects of the SPC website and mesoanalysis page displays into his instruction, providing students with experience using the tools forecasters regularly employ in their operational duties.

Online Climatology Course at OU

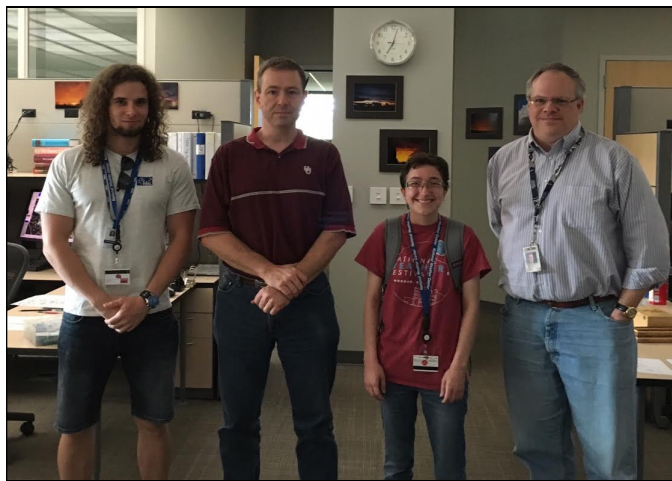
Mesoscale Assistant/Fire Weather Forecaster, Dr. Ashton Cook, also has been involved in bringing SPC expertise to the classroom. The “Managing for a Changing Climate” online course is being developed in cooperation with the University of Oklahoma and the South Central Climate Science Center. The new format for this particular course will use short, three- to six-minute, educational videos that enrolled students can watch in preparation for once-a-week discussions and/or group-work sessions. The videos and online content will also be available to anyone in the general public. Dr. Cook’s specific expertise will address how changing climate may impact severe weather in the future.

All four of these initiatives represent original, unique outreach opportunities that bridge together the various facets of academia, research and operational meteorology within the meteorological community in Norman, Oklahoma, and across the globe. Such collaborative measures are exactly why the National Weather Center

was constructed — to form strong bonds between these various meteorological entities, with a goal of developing relationships through these activities that will extend well into the future, encouraging many students to be strong ambassadors for science and meteorology.

Visiting Scientist and Student Observe SPC Operations

By Roger Edwards, Lead Forecaster and Jeff Peters, Mesoscale/Outlook Forecaster



Left to right: Polish meteorologist Mateusz Taszarek, SPC lead forecaster Roger Edwards, OU undergrad Elizabeth Armstrong, SPC mesoscale/outlook forecaster Jeff Peters.

SPC occasionally hosts individual students and visiting scientists who shadow operations to gain “behind the scenes” insight into how the SPC forecast process works. On May 21, 2016, the evening shift welcomed both kinds of guests.

Mateusz Taszarek, of Adam Mickiewicz University in Poznań, Poland, is a visiting scientist at the [National Severe Storms Laboratory](#) and is working with Dr. Harold Brooks as a part of a spring and summer 2016 sabbatical. Under Harold’s guidance, he is taking new approaches to analyzing the environments and climatology of European severe storms. Part of that involves insights Mateusz gains from his experience at NSSL, in SPC operations, and through participation in the [NOAA Hazardous Weather Testbed](#). On shift, he participated in the diagnostic process, hand-analyzing surface and upper-air charts, as SPC forecasters commonly do for situational understanding, and observed the issuance process for a severe thunderstorm watch in the northern Great Plains. Mateusz also has enjoyed storm chasing and bass fishing in his spare

time in Oklahoma.

Elizabeth Armstrong, a senior at the University of Oklahoma’s School of Meteorology, was the fourteenth college student this year to participate in SPC’s job shadow program. This program began in 2004, fulfilling one of three paths of learning available to OU meteorology students. In addition their to academic studies, these meteorology students have the unique opportunity to work alongside severe-weather scientists on research projects and shadow forecasters during severe-weather operations at the SPC. This three-pronged educational model was purposely designed for the NWC to be similar to a teaching hospital, where students can gain valuable knowledge and experience beyond what is learned in the classroom. The SPC job shadow program allows a college student to observe a forecaster for two hours on two separate days. In addition to learning about the diagnostic process and suite of forecast products, students can participate in hand-analyzing surface and upper-air charts. During the evening of May 21, Elizabeth observed the issuance of two mesoscale discussions for active severe weather across the central and southern High Plains. Overall in 2016, the SPC has hosted over 30 students in the job shadow program.

SPC Science Support Branch — The Pulse of the SPC

By Dr. Patrick Marsh, Gregg Grosshans, Jay Liang, Dr. Israel Jirak, Steve Weiss and Dr. Chris Melick, SPC Science Support Branch

Whenever someone thinks about the Storm Prediction Center, chances are that he or she thinks about the forecast products and the forecasters who produce them. This is to be expected as these forecasts are often

at the forefront of the National Weather Service's severe weather communication. However, what about the individuals supporting the forecasters? The ones who work to keep the computers running reliably and in a secure manner? The ones who keep the data flowing? The ones who come in during the middle of the night when technical problems occur? And the ones who lead the scientific research-to-operations activities, including forecaster training?

Enter the SPC's Science Support Branch.

Composed of eight federal employees, six Cooperative Institute (CI) research associates (with 2 more on the way), and 1 contract IT support specialist, the Science Support Branch (SSB) is tasked with a large number of responsibilities such as; 1) maintaining and improving an extensive array of complex computer hardware/software/networking systems, including those at our operational backup sites at USAF Scott and Offutt AFBs, while ensuring they are all compliant with very rigorous federal IT security regulations for high-impact systems, 2) developing new software/guidance/techniques in support of forecast operations, 3) keeping vast volumes of meteorological data flowing into and forecast products flowing out of SPC, 4) guiding the AWIPS-2 computer system transition at SPC, and 5) being national leaders in the science/forecasting connection. This requires many SSB staff to closely collaborate with various NOAA/NWS science and technology programs and serve on a variety of agency project teams.

Federal employees within SSB are tasked with the day-to-day maintenance of SPC's operational IT infrastructure. This includes, but is not limited to, making sure that all meteorological data arrive, keeping the data visualization systems working smoothly, ensuring that our critical hazardous weather products are transmitted to the public in a timely manner, and keeping the comprehensive SPC website up-to-date. Additionally, many of our SSB staff have advanced degrees in meteorology and most federal meteorologists spend time working forecast shifts to 1) maintain proficiency in severe weather and fire weather forecasting; and 2) fill gaps in the forecast shift schedule arising from vacancies, illness, and official travel.

Federal meteorologists and CI research associates focus much of their work on strengthening the research-to-operations science/forecasting connection. This is done by working closely with other researchers within the federal government and those in academia to develop and expedite the transfer of the latest research into operations. For this purpose, the annual Spring Forecasting Experiment (SFE) is held for 5 weeks with support from the National Severe Storms Laboratory (NSSL) within the Hazardous Weather Testbed (HWT). The SFE provides a unique opportunity for researchers and forecasters from around the world to work side-by-side to evaluate emerging research concepts and tools and participate in experimental forecast generation exercises. Forecasters have direct access to the latest research developments and scientists gain the knowledge to formulate research strategies that will have practical benefits. This collaborative approach ensures an effective, two-way path between research and operations which ultimately improves NWS severe weather forecasts. Additionally, CI research associates assist the Science and Operations Officer (an SSB federal employee) by developing appropriate training material for forecasters to be able to quickly understand and utilize the latest research methods, findings and data. Lastly, our CI satellite specialist oversees the GOES-R Proving Ground at the SPC and HWT, leading efforts on testing, evaluating, and incorporating new satellite-based hazardous weather products into operational use.

To see who these individuals are, please view our Staff Page, which can be found on our website at: <http://www.spc.noaa.gov/staff/>

SPC Participates in 2016 AMS Broadcasters Conference

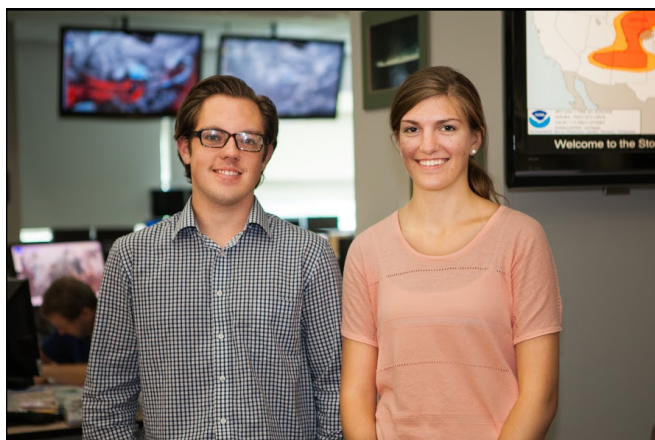
By Bill Bunting, SPC Forecast Operations Branch Chief

SPC Forecast Operations Branch Chief Bill Bunting spoke at the 44th American Meteorological Society Broadcast Meteorology Conference in Austin, TX in June. The conference brought together broadcast meteorologists from across North America to share presentations regarding local forecast techniques and

communications strategies to better convey information to their audiences. Bill's presentation focused on changes to SPC risk communication strategies in the recent past, including the transition to additional tiers of risk categorization for the Day 1 through Day 3 severe weather outlooks, and the introduction of two tiers to the Day 4-8 severe weather outlook. The presentation also highlighted SPC plans for future services, including providing additional detail regarding the timing of severe weather potential in short-term outlooks. Feedback from broadcast meteorologists continues to play a key role in the evolution of new SPC forecast services, and attendance at the conference ensures a continuing dialog to help guide the development of those services.

Hollings Scholarship Students Conduct Research at SPC

By Liz Leitman, Mesoscale Assistant/Fire Weather Forecaster



Left to right: Hollings Scholarship recipients Brandon Centeno and Jessica McDonald collaborated with SPC staff while working on research projects this summer.

The NOAA Ernest F. Hollings Undergraduate Scholarship Program was established in 2005. The purposes of the program are to (1) increase undergraduate training in oceanic and atmospheric science, research, technology, and education and foster multidisciplinary training opportunities; (2) increase public understanding and support for stewardship of the ocean and atmosphere and improve environmental literacy; (3) recruit and prepare students for public service careers with the National Oceanic and Atmospheric Administration and other natural resource and science agencies at the federal, state, and local levels of government; (4) recruit and prepare students for careers as teachers and educators in oceanic and atmospheric science; and (5) improve scientific and environmental education in the United States. Selected students participate in a 10-week internship during the summer months in their field of interest. This year, SPC was fortunate to host two students: Brandon Centeno from the University of Oklahoma and Jessica McDonald from St. Cloud State University. Brandon worked with

several SPC and NWS forecasters, led by Dr. Ariel Cohen, on a research project titled *Analysis of Convective Mode in Severe Thunderstorm Events across Eastern Parts of the Central and Southern Great Plains*. Jessica's research project, led by Dr. James Correia, was titled *Insights Into Predicting Tornado Development Using NEWS-e Vorticity Forecasts*. Their research was presented at NOAA Headquarters in Washington, D.C. in August. We wish them both the best of luck as they finish their degrees in the year ahead!

Fun Fact...

On average, about 1400 tornadoes are reported each year! So far in 2016, 820 tornadoes have been reported. This is far below the average of 1,126 tornado reports through the first week of August.

Hazardous Weather Testbed Spring Experiment Aims to Advance Forecast and Warning Operations

By Dr. Israel Jirak, Science Operations Officer, Dr. James Corriea Jr., SPC/OU CIMMS HWT Liaison and Liz Leitman, Mesoscale Assistant/Fire Weather Forecaster

Each year, researchers and forecasters from the NWS and across the international weather enterprise converge on Norman, OK for a six-week experiment to test and evaluate new models, forecast and warning paradigms, and cutting-edge data and technology.

During the 2016 Hazardous Weather Testbed (HWT) Spring Forecasting Experiment (SFE), considerable focus was placed on the extraction and creation of probabilistic guidance from convection-allowing ensemble prediction systems, and the use of this information by forecast teams to create experimental severe weather hazard outlooks valid over shorter periods (i.e., 4-hr periods) than current SPC convective outlooks. These activities are foundational to the emerging FACETs (Forecasting a Continuum of Environmental Threats) vision and designed to link with initial Warn-on-Forecast activities conducted by the Experimental Warning Program. In addition, the predictability of individual severe weather hazards into the Day 2 period was explored through the examination of convection-allowing guidance.



SPC forecasters Dr. Ariel Cohen and Joey Picca (middle) along with SPC Science Operations Officer Dr. Israel Jirak (lower left) and researcher Dr. Ryan Sobash (top left) evaluate model guidance and create probabilistic forecasts.

A unique aspect of the 2016 SFE was the enhanced coordination that occurred amongst the contributing modeling groups to allow for controlled modeling experiments. For the first time, NSSL, NOAA Global Systems Division (GSD), NOAA Environmental Modeling Center (EMC), National Center for Atmospheric Research (NCAR), Developmental Testbed Center (DTC), University of Oklahoma Center for Analysis and Prediction of Storms (CAPS), and University of North Dakota (UND) worked closely together on developing model specifications and configurations for convection-allowing model (CAM) simulations provided during the 2016 SFE. This group of CAMs was referred to as the Community-Leveraged Unified Ensemble (CLUE). The resultant coordinated experiments from the CLUE were designed to help inform CAM ensemble configuration (e.g., model core, physics, data assimilation, etc.) for future operational implementation of a high-resolution ensemble forecast (HREF) system in the NWS.

As part of the 2016 Experimental Warning Program, a collaboration of researchers from NWS/NSSL and OU-CIMMS participated with the Probabilistic Hazard Information (PHI) experiment. This three-week experiment engaged 9 warning forecasters, 11 emergency managers, 3 broadcast meteorologists, and ~20 researchers simulating a real-life portion of the integrated warning team. Fast, adaptable, object-centric, post-processing techniques using the NSSL Experimental Warn-on-forecast System for ensemble (NEWS-e) forecasts were evaluated. A very basic framework was provided to use the NEWS-e data to show the tracks of the strongest storms and those with low level rotation, synced with current radar to help with tornado warning decision making. These techniques have evolved from activities associated with the Experimental Forecast Program, to create information from large ensembles and synthesize it into a form readily used by forecasters. The goal is to make the ensemble information usable, useful, and understandable quickly on the forecast desk. By collaborating with forecasters, we can aim to integrate new information sources and types into their forecast process by giving them a chance to co-create the data, their presentation, and their usefulness. Forecasters provided feedback in real-time discussions, through semi-structured interviews, surveys, and focus groups.

Interested in learning more about cutting-edge research occurring at the SPC? Visit the publications section of our webpage!

<http://www.spc.noaa.gov/publications/>

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